

## PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

Date of mailing (day/month/year) 05 July 2001 (05.07.01)	From the INTERNATIONAL BUREAU To:  MERRYWEATHER, Colin, Henry J.A. Kemp & Co. 14 South Square Gray's Inn London WC1R 5LX ROYAUME-UNI		
Applicant's or agent's file reference N.77962A CHM	IMPORTANT NOTIFICATION		
International application No. PCT/GB00/03607	International filing date (day/month/year) 20 September 2000 (20.09.00)		

1. The following indications appeared on record concerning:				
<input checked="" type="checkbox"/> the applicant <input type="checkbox"/> the inventor <input type="checkbox"/> the agent <input type="checkbox"/> the common representative				
Name and Address  FRAM EUROPE LIMITED Llantrisant Industrial Estate Llantrisant Pontyclun Glamorgan CF7 8YU United Kingdom	State of Nationality GB		State of Residence GB	
	Telephone No.			
	Facsimile No.			
	Teleprinter No.			

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:				
<input type="checkbox"/> the person <input checked="" type="checkbox"/> the name <input type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence				
Name and Address  SOGEFI FILTRATION LIMITED Llantrisant Industrial Estate Llantrisant Pontyclun Glamorgan CF7 8YU United Kingdom	State of Nationality GB		State of Residence GB	
	Telephone No.			
	Facsimile No.			
	Teleprinter No.			

3. Further observations, if necessary:				
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4. A copy of this notification has been sent to:				
<input checked="" type="checkbox"/> the receiving Office <input type="checkbox"/> the International Searching Authority <input checked="" type="checkbox"/> the International Preliminary Examining Authority		<input type="checkbox"/> the designated Offices concerned <input checked="" type="checkbox"/> the elected Offices concerned <input type="checkbox"/> other:		

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	Authorized officer  Anman QIU  Telephone No.: (41-22) 338.83.38
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## PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION  
(PCT Rule 61.2)

Date of mailing (day/month/year) 18 June 2001 (18.06.01)	To:  Commissioner US Department of Commerce United States Patent and Trademark Office, PCT 2011 South Clark Place Room CP2/5C24 Arlington, VA 22202 ETATS-UNIS D'AMERIQUE  in its capacity as elected Office
International application No. PCT/GB00/03607	Applicant's or agent's file reference N.77962A CHM
International filing date (day/month/year) 20 September 2000 (20.09.00)	Priority date (day/month/year) 29 September 1999 (29.09.99)
Applicant MULES, Robert, Stephen	

1. The designated Office is hereby notified of its election made:

 in the demand filed with the International Preliminary Examining Authority on:

26 March 2001 (26.03.01)

 in a notice effecting later election filed with the International Bureau on:2. The election  was was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	Authorized officer  Olivia TEFY  Telephone No.: (41-22) 338.83.38
---	---

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>N.77962A CHM</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/GB 00/03607</b>	International filing date (day/month/year) <b>20/09/2000</b>	(Earliest) Priority Date (day/month/year) <b>29/09/1999</b>
Applicant <b>FRAM EUROPE LIMITED</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

contained in the international application in written form.

filed together with the international application in computer readable form.

furnished subsequently to this Authority in written form.

furnished subsequently to this Authority in computer readable form.

the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2.  **Certain claims were found unsearchable** (See Box I).

3.  **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

the text is approved as submitted by the applicant.

the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

the text is approved as submitted by the applicant.

the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

as suggested by the applicant.

because the applicant failed to suggest a figure.

because this figure better characterizes the invention.

1

None of the figures.

## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/GB 00/03607

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 7 B01D29/21 B01D35/153 B01D35/16

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 43 30 840 C (HENGST WALTER GMBH & CO KG) 16 February 1995 (1995-02-16) figure 1 ----	1-10,12, 13
Y	DE 35 38 589 A (HENGST WALTER GMBH & CO KG) 7 May 1987 (1987-05-07) figures 1,3 ----	1-10,12, 13
Y	EP 0 800 850 A (FILTRAUTO) 15 October 1997 (1997-10-15) figure 1 ----	1-10,12, 13
A	DE 41 31 353 A (KNECHT FILTERWERKE GMBH) 1 October 1992 (1992-10-01) figure 4 ----- ----- -----	11

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

## ° Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

18 December 2000

Date of mailing of the international search report

28/12/2000

Name and mailing address of the ISA  
 European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.  
 Fax: (+31-70) 340-3016

Authorized officer

De Paepe, P

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/03607

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 4330840	C	16-02-1995	NONE	
DE 3538589	A	07-05-1987	NONE	
EP 0800850	A	15-10-1997	FR 2747318 A DE 69700097 D DE 69700097 T ES 2127032 T	17-10-1997 25-02-1999 30-09-1999 01-04-1999
DE 4131353	A	01-10-1992	DE 4201041 A WO 9217262 A DE 59201345 D DE 59208594 D EP 0577660 A EP 0653234 A ES 2071497 T ES 2103519 T JP 6508294 T US 5589060 A US 5698097 A DE 4131354 A	22-07-1993 15-10-1992 16-03-1995 10-07-1997 12-01-1994 17-05-1995 16-06-1995 16-09-1997 22-09-1994 31-12-1996 16-12-1997 15-10-1992

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**PATENT COOPERATION TREATY**  
**PCT**

**INTERNATIONAL SEARCH REPORT**

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference  N.77962A CHM	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No.  PCT/GB 00/03607	International filing date (day/month/year)  20/09/2000	(Earliest) Priority Date (day/month/year)  29/09/1999
Applicant  FRAM EUROPE LIMITED		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
  - the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :
  - contained in the international application in written form.
  - filed together with the international application in computer readable form.
  - furnished subsequently to this Authority in written form.
  - furnished subsequently to this Authority in computer readable form.
  - the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
  - the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished
- 2.  **Certain claims were found unsearchable** (See Box I).
- 3.  **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

- the text is approved as submitted by the applicant.
- the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- the text is approved as submitted by the applicant.
- the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

- as suggested by the applicant.
- because the applicant failed to suggest a figure.
- because this figure better characterizes the invention.

1

None of the figures.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/03607

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B01D29/21 B01D35/153 B01D35/16

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	EP 0 800 850 A (FILTRAUTO) 15 October 1997 (1997-10-15) figure 1 ---	1-10,12, 13
A	DE 41 31 353 A (KNECHT FILTERWERKE GMBH) 1 October 1992 (1992-10-01) figure 4 -----	11

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

## \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

18 December 2000

Date of mailing of the international search report

28/12/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

De Paepe, P

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/03607

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
DE 4330840	C	16-02-1995	NONE		
DE 3538589	A	07-05-1987	NONE		
EP 0800850	A	15-10-1997	FR 2747318 A DE 69700097 D DE 69700097 T ES 2127032 T	17-10-1997 25-02-1999 30-09-1999 01-04-1999	
DE 4131353	A	01-10-1992	DE 4201041 A WO 9217262 A DE 59201345 D DE 59208594 D EP 0577660 A EP 0653234 A ES 2071497 T ES 2103519 T JP 6508294 T US 5589060 A US 5698097 A DE 4131354 A	22-07-1993 15-10-1992 16-03-1995 10-07-1997 12-01-1994 17-05-1995 16-06-1995 16-09-1997 22-09-1994 31-12-1996 16-12-1997 15-10-1992	

# PATENT COOPERATION TREATY

## PCT

REC'D 27 NOV 2001

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference  N.77962A CHM	<b>FOR FURTHER ACTION</b>	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No.  PCT/GB00/03607	International filing date (day/month/year)  20/09/2000	Priority date (day/month/year)  29/09/1999
International Patent Classification (IPC) or national classification and IPC  B01D29/21		
Applicant  SOGEFI FILTRATION LIMITED		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I  Basis of the report
- II  Priority
- III  Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV  Lack of unity of invention
- V  Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI  Certain documents cited
- VII  Certain defects in the international application
- VIII  Certain observations on the international application

Date of submission of the demand  26/03/2001	Date of completion of this report  26.11.2001
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer  De Paepe, P  Telephone No. +31 70 340 2326



# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/03607

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

3,4,6,7 as originally filed

1,2,5 as received on 04/09/2001 with letter of 03/09/2001

**Claims, No.:**

1-11 as received on 04/09/2001 with letter of 03/09/2001

### **Drawings, sheets:**

1/2,2/2 as originally filed

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB00/03607

the description,      pages:  
 the claims,      Nos.:  
 the drawings,      sheets:

5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):  
*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	1-11
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-11
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-11
	No:	Claims	

**2. Citations and explanations  
see separate sheet**

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**Closest prior art:** D2: DE-A-35 38 589

**Differences:** the loading element being resilient.

**Problem:** How to provide a loading element, effective to close the drain outlet without the need for high tolerances in the design of the housing cover.

**Solution:** Problem is solved by the above mentioned differences.

According to D3 a different problem is solved, i.e.: how to provide a loading element, effective to seal the filtrate outlet without the need for high tolerances in the design of the housing cover.

In D3, no drain outlet, avoiding the contact between the unfiltered feed and the filtrate during the removal of the filter element, is disclosed and the filtrate outlet (Fig. 1; 16) is just sealed (see Fig. 1; 32, 38) from the inlet (Fig. 1; 14).

Physically replacing the loading element (Fig. 1; 18 - see also col. 4, lines 37-39) of D2 by the spring (D3-Fig. 1; 36) might produce an arrangement within the scope of claim 1, this is merely an argument that the skilled man could arrive at the present invention, but it would be improper to use this argument to deny inventive step, because there is no reason (in D3, no drain outlet, sealing element instead of a closing element) the skilled person would thus combine the documents D2 and D3.

Thus the subject-matter of claim 1 fulfills the requirements of Art. 35 (2) PCT.

The subject matter of the dependent claims 2-11 represents in combination with the independent claim 1 new and inventive particular embodiments of the invention.

CLAIMS

1. A fluid filter assembly comprising:
  - 5 a housing having a fluid inlet and a fluid outlet, and
  - a filter element mounted on a support within the housing between the fluid inlet and the fluid outlet,
    - 10 wherein the housing has a drain outlet closed by the filter element support and the fluid filter assembly further comprises a loading element loading the support against the drain outlet.
2. A fluid filter assembly according to claim 1, wherein the loading element is a resilient loading element.
- 15 3. A fluid filter assembly according to claim 1 or 2, wherein the loading element also loads sealing faces of the support which seal the filter element between the fluid inlet and the fluid outlet.
4. A fluid filter assembly according to any one of the preceding 20 claims, wherein the housing comprises a base and a removable cap fitted together, the drain outlet being formed in the base.
5. A fluid filter assembly according to claim 4 when appendant to claim 2, wherein the resilient loading element is provided between the support and 25 the cap.
6. A fluid filter assembly according to claim 4 or 5, wherein the support is retained on the removable cap.
- 30 7. A fluid filter assembly according to claim 6, wherein the support has a retaining portion protruding from the support and engaging the cap, and the

*Refiled 10/10/2003*

loading element is a coiled spring, the coils of which encircle the retaining portion.

9. A fluid filter assembly according to any one of the preceding claims, wherein the filter element is annular and the support includes an annular end wall extending around one end of the filter element, the annular end wall closing the drain outlet and the loading element loading the support axially.

10. A fluid filter assembly according to claim 9, wherein the annular end wall of the support has a resilient annular valve element adjacent thereto which constitutes a non-return valve across the fluid inlet and which seals the drain outlet.

11. A fluid filter assembly according to claim 10, wherein the annular valve element comprises a base portion disposed adjacent the annular end wall of the support, the base portion sealing the drain outlet, and a flexible flap extending from the base portion to close the fluid inlet and constitute the non-return valve.

12. A fluid filter assembly according to claim 10 or 11, wherein the valve element is retained on the annular end wall of the support.

20 13. A fluid filter assembly according to any one of the preceding claims, wherein the fluid outlet is disposed adjacent the drain outlet and has a rim protruding into the housing beyond the drain outlet.

1 into the centre of the core 14.

The core 14 and hence the filter element 1 and the end walls 12 and 13 are retained on the cap by a plurality of axial projections 16 circumferentially spaced around the core 14, each with a radially outwardly extending lip 17 and together

- 5 constituting a retaining portion. The cap 4 is formed with a plurality of projections 18 extending axially from the end wall 8 of the cap 4 and spaced circumferentially around the outside of the projections 16 of the core 14. The projections 18 of the cap 4 each have an inwardly extending lip 19 which radially overlap the lips 17 on the projections 16 of the core 14. Accordingly, engagement between the lips 17 and 19
- 10 retains the core 14 on the cap 4 when it is removed from the base 3 whilst allowing some relative axial movement between the core 14 and the cap 4.

As a result of the gaps between the two sets of projections 16 and 18, during manufacture it is easy to fit the core 14 to the cap 4 by forcing the core 14 onto the cap 4 and radially deflecting either or both sets of projections 16 and 18 to allow the

- 15 lips 17 and 19 to pass.

Arranged within the core 14 at the end nearest the cap 4 is a conventional over-pressure valve constituted by a valve member 20 engaged by hooked arms 21 to a valve spring 22 held by an annular flange 23 projecting internally from the core 14.

A coiled spring 33 is disposed between the cap 4 and the core 14 with its

- 20 coils encircling the projections 16 of the core 14. The spring 33 acts as a resilient loading element to bias the core 14 axially of the filter element 1 away from the cap 4 by engaging the shoulder 15 formed on the core 14. Although a spring is preferred, any resilient loading element may alternatively be used, for example a metal press.
- 25 Alternatively, a weight could be provided as a loading element to bias the core downwardly in use.

The end wall 5 of the base 3 is formed with a fluid outlet 24 disposed in the centre of the end wall 5 with its rim 25 projecting into the core 14 through the centre of the first annular end wall 12. A circular wall 26 is upstanding on the end wall 5 of the base 3 encircling the fluid outlet 24 of the base. A fluid inlet 27 extends through

- 30 the end wall 5 of the base 3 outside the circular wall 26. The fluid inlet 27 is formed in this instance by three openings as shown in Fig. 3, but any number of openings may

-2-

against the drain outlet.

Accordingly, on removal of the filter element and the support, the drain outlet is opened and the residual oil in the housing is allowed to drain. As a result of using the filter element support to close the drain outlet, it is not necessary to provide a separate valve within the drain outlet. Therefore the cost and difficulty of manufacture of such a drain outlet valve are avoided. Similarly, the problems of such a drain outlet valve clogging or being damaged are avoided.

10 The loading element loading the support against the drain outlet is effective to close the drain outlet tightly. This avoids the need to provide the filter element support with a tight fit within the housing which would create difficulties in manufacture given the small tolerances required and would introduce difficulties in insertion and removal of the filter element.

15 In addition, the loading element can be used to load sealing faces of the support which seal the filter element between the fluid inlet and the fluid outlet. Therefore, the loading element can be provided with the additional purpose of effecting a tight seal for the filter element as well as tightly closing the drain outlet and hence be given a dual-purpose.

Preferably, the loading element is a resilient loading element.

20 The present invention may be advantageously applied to a conventional type of filter assembly in which the housing comprises a base and a removable cap fitted together, the drain outlet being formed in the base. In such an assembly, the cap may be removed to allow replacement of the filter element. Conveniently the loading element is provided between the support and the cap.

25 Desirably, the support is retained on the removable cap. As a result, when the cap is removed, the filter element and support are also removed by virtue of being retained on the cap, which in turn causes opening of the drain outlet to allow draining of the fluid.

30 Advantageously, the support has a retaining portion protruding from the support and engaging the cap, and the loading element is a coiled spring, the coils of which encircle the retaining portion. This provides a compact structure for the loading element and retaining portion.

-1-

FILTER ASSEMBLY WITH DRAIN OUTLET

The present invention relates to a fluid filter assembly for filtering a fluid using a filter element mounted on a support in a housing between a fluid inlet and 5 fluid outlet formed in the housing. In particular, the present invention relates to the provision of a drain outlet in the housing.

The present invention may be applied to an oil filter assembly, for example of the type used in a combustion engine. In such an assembly, the filter element is typically in the form of a corrugated sheet formed into an annulus and mounted on a 10 support including annular end walls extending around respect ends of the filter element.

It is known to provide such a filter assembly with a drain outlet which has the purpose of draining oil from the housing when the filter element is replaced. Typically, the drain outlet will be connected to a sump such as an oil pan in the case 15 of a conventional combustion engine.

In known structures, the drain outlet is provided with a valve to prevent loss of oil during normal use of the filter assembly. Typically the valve is arranged in a machined bore and has numerous metal and/or plastic parts arranged to close the outlet using a ball bearing. Such a drain outlet valve is therefore difficult and 20 expensive to manufacture. Furthermore, the location of the drain outlet valve at the bottom of the housing is disadvantageous as contaminants and sludge in the oil tend to collect and over time cause clogging or damage to the valve. It is physically difficult to clean or replace the valve given its location. The present invention is intended to improve the drain outlet arrangement.

25 According to the present invention, there is provided a fluid filter assembly comprising:

a housing having a fluid inlet and a fluid outlet; and  
a filter element mounted on a support within the housing between the fluid inlet and the fluid outlet,

30 wherein the housing has a drain outlet closed by the filter element support and the fluid filter assembly further comprises a loading element loading the support

# INTERNATIONAL SEARCH REPORT

Inten. Application No.  
PCT/GB 00/03607

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 B01D29/21 B01D35/153 B01D35/16

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 43 30 840 C (HENGST WALTER GMBH & CO KG) 16 February 1995 (1995-02-16) figure 1	1-10, 12, 13
Y	DE 35 38 589 A (HENGST WALTER GMBH & CO KG) 7 May 1987 (1987-05-07) figures 1,3	1-10, 12, 13
Y	EP 0 800 850 A (FILTRAUTO) 15 October 1997 (1997-10-15) figure 1	1-10, 12, 13
A	DE 41 31 353 A (KNECHT FILTERWERKE GMBH) 1 October 1992 (1992-10-01) figure 4	11

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

### \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
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- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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- \*&\* document member of the same patent family

Date of the actual completion of the international search  18 December 2000	Date of mailing of the international search report  28/12/2000
Name and mailing address of the ISA  European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Authorized officer  De Paepe, P

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/03607

Patent document cited in search report	Publication date	Patent family member(s)			Publication date
DE 4330840	C	16-02-1995			NONE
DE 3538589	A	07-05-1987			NONE
EP 0800850	A	15-10-1997	FR	2747318 A	17-10-1997
			DE	69700097 D	25-02-1999
			DE	69700097 T	30-09-1999
			ES	2127032 T	01-04-1999
DE 4131353	A	01-10-1992	DE	4201041 A	22-07-1993
			WO	9217262 A	15-10-1992
			DE	59201345 D	16-03-1995
			DE	59208594 D	10-07-1997
			EP	0577660 A	12-01-1994
			EP	0653234 A	17-05-1995
			ES	2071497 T	16-06-1995
			ES	2103519 T	16-09-1997
			JP	6508294 T	22-09-1994
			US	5589060 A	31-12-1996
			US	5698097 A	16-12-1997
			DE	4131354 A	15-10-1992